



A unique world-first technological concept
Gottwald ASC Automated Stacking Cranes

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Significantly increasing productivity

Worldwide container traffic is growing: tonnage, vessels and cargo-handling volumes are increasing. This means that terminal operators face major logistical challenges: boosting the productivity of their terminals while expanding existing terminal infrastructures and building new ones.

Environmental issues are also gaining in importance. Not only should the equipment achieve a high level of performance, it must also be environmentally friendly – a requirement, for example, when terminal concessions are awarded.

Innovative solutions are in demand

The increasing demand for innovative container-handling equipment and systems must demonstrate:

- high stacking density, optimum use of space
- high working speeds, high handling rates
- crane and system software, maximum efficiency
- drive technology that makes efficient use of resources.

Automated handling equipment, like the world's first Gottwald ASCs at Antwerp Gateway in Belgium ...

Focus on automation

These requirements put the spotlight on automating terminal logistics.

The essential benefits are:

- improved productivity
- lower labour and operating costs
- greater degree of safety
- dependable operation, in nearly all weathers.



... and entire fleets of AGVs, as used at Container-Terminal Altenwerder in Hamburg, Germany, among other locations, as unmanned, computer-controlled container transporters ...

Gottwald: leading innovation in automated cargo handling

Well-known as the world's market leader in Mobile Harbour Cranes, Gottwald is also the pacesetter in the automation of terminal logistics – not just in Automated Guided Vehicles (AGVs), which have proved their worth as computer-controlled container transporters with respected terminal operators for many years.

ASC Automated Stacking Cranes

Gottwald now continues its innovative leadership role in the field of automation

technology with its ASC, combined with Gottwald's own dedicated management software (ASC-MS), to enable fully-automated management of container stackyards and seamless integration of quayside and landside vehicles.

Together with the AGVs, the ASCs form fully-automated, integrated system solutions – from the quayside to the stackyard. Or they replace conventional stacking cranes and straddle carriers or work on the quayside in conjunction with existing fleets of straddle carriers.

The benefits of ASC technology

Maximum utilisation of space and stacking density thanks to:

- Twin ASCs on a single pair of rails
- 1-over-5 solution for high-cube containers.

Accurate positioning even at high winds of up to force 10 Beaufort ascribable to:

- rigidity in all three axes, which is a result of the
- fixed-leg concept and
- rigid guiding beam.

Innovative systems including:

- management
- anti-collision and
- innovative brake system.

Strong partners

Terminal operators need strong partners. Gottwald is a member of the Demag Cranes Group, one of the world's leading providers of industrial cranes, crane components, harbour cranes and terminal automation technology.

This includes state-of-the-art simulation and emulation technologies to help terminal operators in making sound investment decisions based on a realistic view of the terminal structures and performance before they commit themselves.



... handle ever increasing volumes of container traffic which is expanding at high rates every year

Outstanding technological concept

ASC Automated Stacking Cranes by Gottwald

Gottwald ASCs are in demand wherever terminal operators require significant increases in stacking density and productivity.

The groundbreaking technological concept stands out both visually and in terms of its pioneering approach, as witnessed by the rigid, vertical guiding beam. Of proven capability in daily operation, these machines make full use of the reliable structural design, control engineering and safety-related components that have been field-tested in existing Gottwald portal cranes. This equipment guarantees:

- fast
- accurate
- safe
- ecologically-sound operation.

Maximum use of space

Each stack module uses two ASCs, or Twin ASCs, running on a single pair of rails. This configuration allows terminal operators to save a significant amount of space – up to 18% compared to other well-known configurations such as cross-over systems, and yet allows for redundancy in each stack module, a requirement that customers demand.

Storage and retrieval frequencies and container dwell time in the stack are the key factors when defining the span, which is between 8 and 11 containers, where the stackyard length is typically between 35 and 50 TEUs.

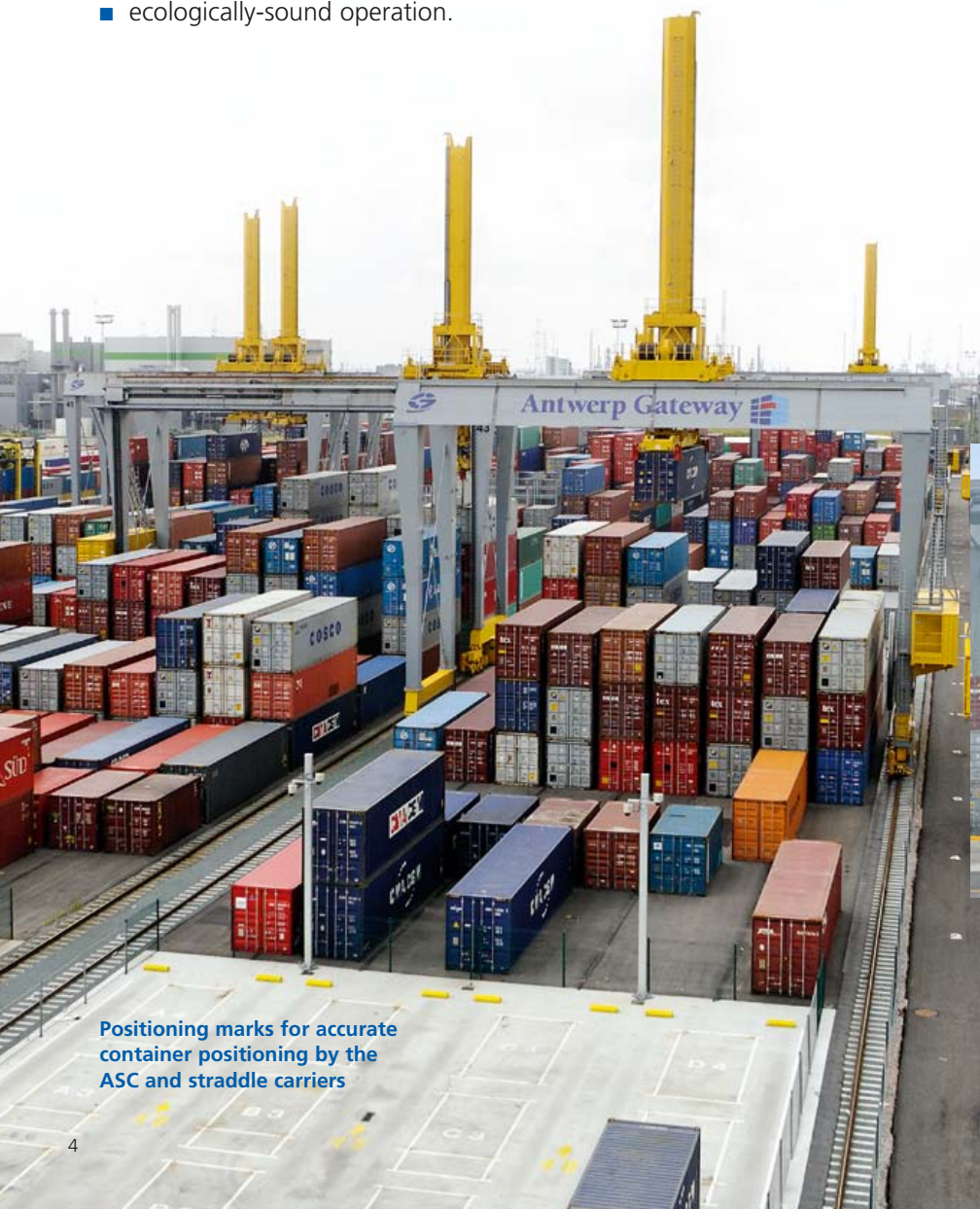
High working speeds

Exceptionally high working speeds in all three axes (crane and trolley travel and hoisting action), coupled with redundancy and the opportunity to run in parallel in the most compact space are just some of the unique features that increase terminal performance.

Automated storage and retrieval

Quayside storage and retrieval operations in conjunction with manual or automated transport vehicles are fully-automated. The unique anti-collision system has even been approved by the safety authorities to allow simultaneous operation of our ASCs and manual transport vehicles such as straddle carriers in the interchange zone.

For landside storage and removal in conjunction with a railway link or road trucks, Gottwald's ASCs are equipped with an innovative, fully automated camera based system.



Traffic lights control safe access for straddle carriers

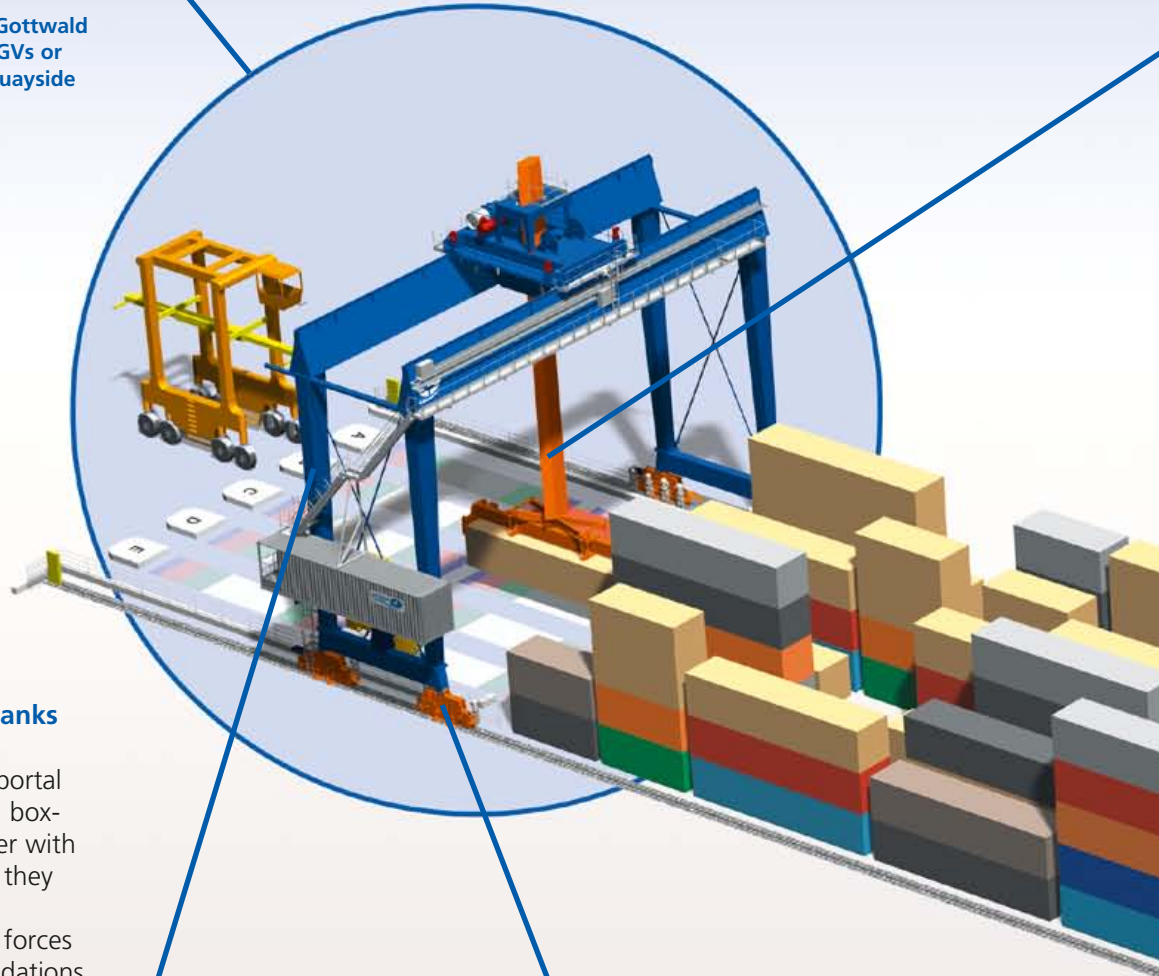
Positioning marks for accurate container positioning by the ASC and straddle carriers

Redundancy creates safety: interchange zones on the quayside and landside four TEUs end-to-end. If the quayside ASC should, for some reason, not be in operation, it will move to its end position and allow the landside ASC to take over its work load.



Simultaneous operation of two Gottwald ASCs and fully automated Lift AGVs or manual straddle carriers in the quayside interchange zone

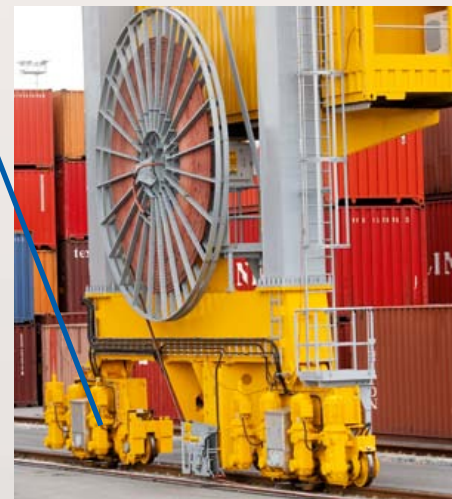
Quayside



Robust and economical thanks to the fixed-leg concept

Gottwald's ASCs are sturdy portal cranes designed as fixed-leg, box-girder constructions. Together with the intelligent brake system, they guarantee these features:

- optimised transmission of forces into the rails and rail foundations
- much reduced horizontal forces mean lower investments in rails and rail foundations.





Vibration-free thanks to the rigid guiding beam

Totally new concept in the industry: rigid guiding beam instead of rope fields which tend to sway. Moved by powerful four-rope hoists and guided by rollers to provide:

- fast, accurate positioning under all loading conditions and in winds up to force 10 Beaufort
- fast corrections at road truck interchange
- long rope lifetimes: multiple rope deflections not needed, no rope adjustments.



View of the rail brake during installation

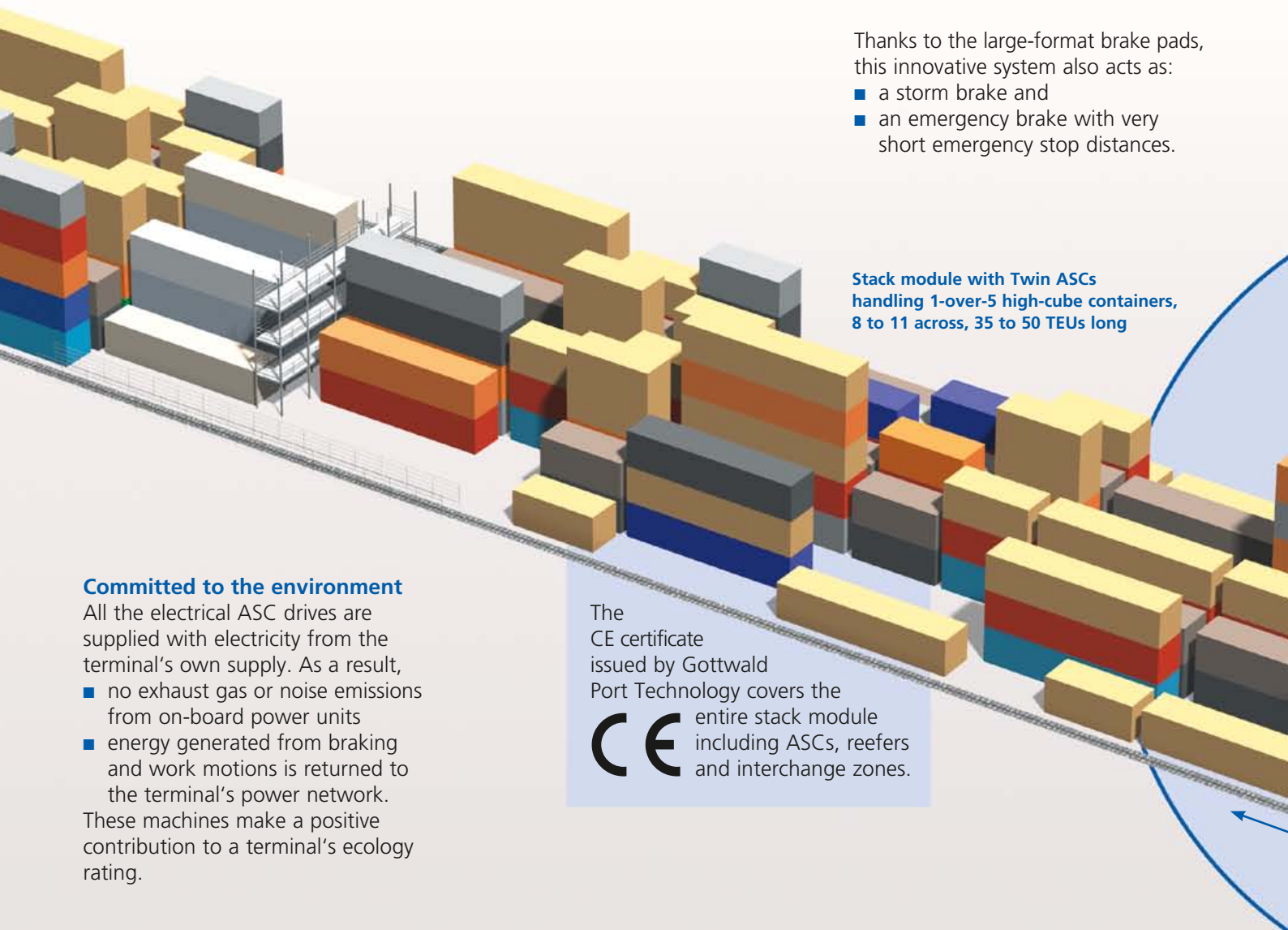
New brake system – fast, safe, precise and economical

Gottwald's intelligent brake system acts directly on the rail. The number of brake pads actually applied depends on the position of the trolley and the weight suspended from the spreader.

Shorter braking distances translate not only into improved handling performance, this braking system also minimises the horizontal forces, which means lower investment in the rails and their infrastructure.

Thanks to the large-format brake pads, this innovative system also acts as:

- a storm brake and
- an emergency brake with very short emergency stop distances.



Stack module with Twin ASCs handling 1-over-5 high-cube containers, 8 to 11 across, 35 to 50 TEUs long

Committed to the environment

All the electrical ASC drives are supplied with electricity from the terminal's own supply. As a result,

- no exhaust gas or noise emissions from on-board power units
- energy generated from braking and work motions is returned to the terminal's power network.

These machines make a positive contribution to a terminal's ecology rating.

The CE certificate issued by Gottwald Port Technology covers the



entire stack module including ASCs, reefers and interchange zones.

Technical data	
Dimensions of stack module	
Typical length	35 – 50 TEUs
Span*	32.5 m for 9 container rows
Typical container spacing	500 mm end-to-end 400 mm side-to-side
Min. working spacing between two ASCs	2 TEUs
ASC dimensions and weight	
Working height	1 over 5 high-cube containers
Working span	9 containers
Track gauge*	28 m
Length	13.5 m
Weight	240 t
Crane kinematics at full load and ≤ force 7 Bft	
Working speeds	
Gantry travel	240 m/min
Trolley travel	60 m/min
Hoisting / lowering (up to force 10 Beaufort)	39 – 72 m/min (full – empty)
Acceleration / deceleration	
Gantry travel	0.4 m/s ²
Trolley travel	0.4 m/s ²
Hoisting / lowering (up to force 10 Beaufort)	0.35 m/s ²
* Span and track gauge for 8, 10 or 11 containers available on request	

Gottwald's ASCs are fully operational at winds up to force 10 Beaufort

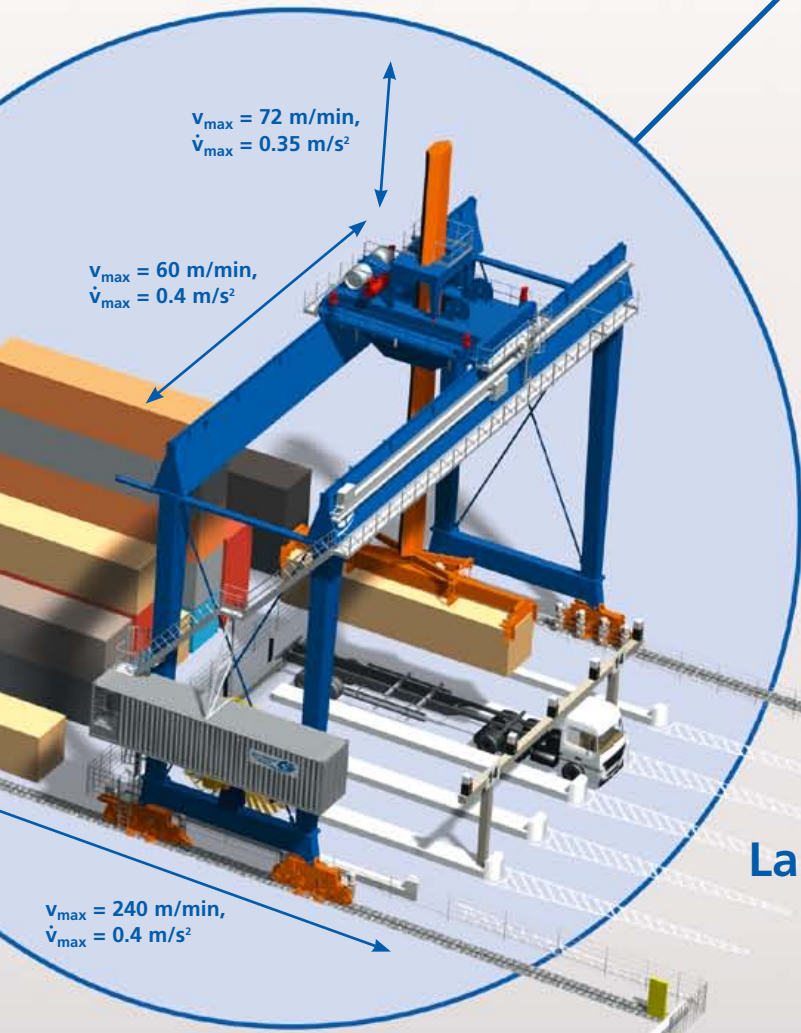


Two general-view cameras and four corner casting cameras guarantee secure, accurate positioning on road trucks on the landside



Innovative camera system for landside container handling

For landside container handling, the ASC travels to the edge of the interchange zone. After that, the crane is taken over by the control centre. Thanks to the innovative camera system, the container can be accurately deposited semi-automatically on the road truck. The order is reversed if the container is to be moved from the truck to the stackyard.



The positioning accuracy and safety systems implemented mean far lower investment in buffers



Landside

Services for automated cargo-handling equipment

Gottwald keeps machine fleets in motion

Gottwald automated cargo-handling equipment such as the ASC and the AGV function as software-controlled systems and operate as fleets within sophisticated system solutions. If a single piece of equipment breaks down, it can affect the entire fleet.

Fleet management service

Gottwald has set up a special service organisation to ensure that automated equipment fleets are properly looked after. The expertise of these service engineers enables them to deal with the special requirements of an automated terminal. Gottwald has developed a detailed implementation plan for fleet management that can be adapted for the customer in question. Our aim is always to provide the agreed levels of availability and reliability.



Services include:

- co-ordination and performance of preventative maintenance and overhaul work
- immediate performance of unscheduled corrective maintenance
- supply of spare and wear & tear parts
- hotline support customised to the needs of automated products.

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